TP121V-04
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U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS 121V (Vehicles)

Air Brake Systems

SAFETY ASSURANCE
Office of Vehicle Safety Compliance
Room 6111, NSA-30
400 Seventh Street, SW
Washington, DC 20590

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REVISION CONTROL LOG
FOR OVSC LABORATORY
TEST PROCEDURES

TP-121V
AIR BRAKE SYSTEMS
VEHICLE TEST

TEST PROCEDURE		FMVSS 121V		DESCRIPTION
REV. No.	DATE	AMENDMENT	EFFECTIVE DATE	
01	2/6/74			Minor update
02	3/16/78			Minor update
03	9/12/97			Major revisions
04	6/4/99			Minor revisions
05				
06				
07				
08				
09				

1. PURPOSE AND APPLICATION

The Office of Vehicle Safety Compliance (OVSC) provides contractor laboratories with Laboratory Test Procedures as guidelines for obtaining compliance test data. The data are used to determine if a specific vehicle or item of motor vehicle equipment meets the minimum performance requirements of the subject Federal Motor Vehicle Safety Standard (FMVSS). The purpose of the OVSC Laboratory Test Procedures is to present a uniform testing and data recording format, and provide suggestions for the use of specific equipment and procedures. If any contractor views any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard (FMVSS) or observes deficiencies in a Laboratory Test Procedure, the contractor is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Every contractor is required to submit a detailed test procedure to the COTR before initiating the compliance test program. The procedure must include a step-by-step description of the methodology to be used. The contractor's test procedure shall contain a complete listing of test equipment with make and model number and a detailed check-off sheet. The list of test equipment shall include instrument accuracy and calibration dates. All equipment shall be calibrated in accordance with the manufacturer's instructions. There shall be no contradictions between the Laboratory Test Procedure and the contractor's in-house test procedure. Written approval of the in-house test procedures shall be obtained from the COTR before initiating the compliance test program. The OVSC Laboratory Test Procedures are not intended to limit or restrain a contractor from developing or utilizing any testing techniques or equipment, which will assist in procuring the required compliance test data. These Laboratory Test Procedures do not constitute an endorsement or recommendation for use of any product or method. However, the application of any such testing technique or equipment is subject to prior approval of the COTR.

NOTE: The OVSC Laboratory Test Procedures, prepared for the limited purpose of use by independent laboratories under contract to conduct compliance tests for the OVSC, are not rules, regulations or NHTSA interpretations regarding the meaning of a FMVSS. The Laboratory Test Procedures are not intended to limit the requirements of the applicable FMVSS(s). In some cases, the OVSC Laboratory Test Procedures do not include all of the various FMVSS minimum performance requirements. Recognizing applicable test tolerances, the Laboratory Test Procedures may

1. PURPOSE AND APPLICATION....Continued

specify test conditions that are less severe than the minimum requirements of the standard. In addition, the Laboratory Test Procedures may be modified by the OVSC at any time without notice, and the COTR may direct or authorize contractors to deviate from these procedures, as long as the tests are performed in a manner consistent with the standard itself and within the scope of the contract. Laboratory Test Procedures may not be relied upon to create any right or benefit in any person. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits its certification tests to those described in the OVSC Laboratory Test Procedures.

2. SECURITY

The contractor shall provide appropriate security measures to protect the OVSC test vehicles, items of motor vehicle equipment, and Government Furnished Property (GFP) from unauthorized personnel during the entire compliance-testing program. The contractor is financially responsible for any acts of theft and/or vandalism, which occur during the storage of test vehicles, items of motor vehicle equipment and GFP. Any security problems, which arise, shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within one working day after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within two working days.

The contractor shall protect and segregate the data that evolves from compliance testing before and after each vehicle or item of motor vehicle equipment test. No information concerning the vehicle or equipment item safety compliance testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Group Supervisor or Division Chief.

No individuals, other than contractor personnel directly involved in the compliance testing program, shall be allowed to witness any vehicle or equipment item compliance test unless specifically authorized by the COTR.

3. GOOD HOUSEKEEPING

Contractors shall maintain the entire vehicle or item of motor vehicle equipment, compliance testing area, test fixtures and instrumentation in a neat, clean and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

4. TEST SCHEDULING AND MONITORING

The contractor shall submit a test schedule to the COTR prior to testing. Tests shall be completed as required in the contract. Scheduling shall be adjusted to permit sample motor vehicles to be tested to other FMVSS as may be required by the OVSC. All testing shall be coordinated with the COTR to allow monitoring by OVSC personnel.

5. GOVERNMENT FURNISHED PROPERTY (GFP)

ACCEPTANCE OF TEST VEHICLE

The Contractor has the responsibility of accepting an OVSC purchased test vehicle from either a new vehicle dealer or a vehicle transporter. In both instances, the contractor acts in the OVSC's behalf when signing an acceptance of the test vehicle. If the vehicle is delivered by a dealer, the contractor must check to verify the following:

A. All options listed on the "window sticker" are present on the test vehicle.

B. Tires and wheel rims are the same as listed.

C. There are no dents or other interior or exterior flaws.

D. The vehicle has been properly prepared and is in running condition.

E. The glove box contains an owner's manual, warranty document, consumer information, and extra set of keys.

F. Proper fuel filler cap is supplied on the test vehicle.

If the test vehicle is delivered by a government-contracted transporter, the contractor should check for damage, which may have occurred during transit.

A "Vehicle Condition" form will be supplied to the contractor by the COTR when an OVSC purchased test vehicle is transferred from the new car dealer or between test contracts. The upper half of the form describes the vehicle in detail, and the lower half provides space for a detailed description of the posttest condition. Vehicle Condition forms must be returned to the COTR with the copies of the Final Test Report or the reports will NOT be accepted.

5. GOVERNMENT FURNISHED PROPERTY (GFP)....Continued

ACCEPTANCE OF EQUIPMENT

All equipment items will be inventoried upon receipt and checked against the shipping documents. Any missing or broken parts will be reported immediately to the COTR. A running inventory list will be maintained until the complete matrix list of test samples is received.

NOTIFICATION OF COTR

The COTR must be notified within one working day after a vehicle and/or equipment item have been delivered.

RECEIPT

A log entry shall be prepared for each incoming item reflecting part number (if applicable), nomenclature, date of receipt, quantity received, condition, completeness, location of item, and contract number. The item shall be tagged with identifying information indicating government ownership.

STORAGE

Government furnished property shall be segregated from company property. Storage shall be in accordance with standard practices established for a particular item and comply with approval practices relating to security measures, fire, moisture, and temperature hazards. Items in storage shall be inspected every 90 days.

6. FACILITY AND EQUIPMENT

TEST TRACK REQUIREMENTS

A. Service and Emergency Stopping Distance Tests

Tests conducted on a straight 12 ft (+2 in/-0 in) wide roadway with a peak friction coefficient (PFC) of 0.9 (dry Portland cement concrete or equivalent surface). The vehicle shall be aligned with the center of the roadway at the beginning of each stop. The roadway shall be marked on both sides. The PFC shall be measured using an American Society for Testing and Materials (ASTM) E1136 standard reference test tire, in accordance with ASTM Method E1337-90, at a speed of 40 mph. The track shall be flat within 1% grade in all directions.

6. FACILITY AND EQUIPMENT....Continued

B. Stability and Control Tests

Tests conducted on a 500-ft radius curved (measured at the center) 12 ft (+2 in/-0 in) wide roadway with a PFC of 0.5. The vehicle shall be aligned with the center of the roadway at the beginning of each stop. The roadway shall be marked on both sides. The PFC shall be measured for tangent points along the length of the curve using an ASTM E1136 standard reference test tire, in accordance with ASTM Method E1337-90, at a speed of 40 mph, with water delivery. The track shall be flat within 1% grade in all directions. The arc length must be at least 300 ft and a 100 ft approach to the arc is recommended to properly align the vehicle to the lane.

C. Grade Holding Tests

Tests conducted on clean dry Portland cement concrete or equivalent surface and have a grade of 20% (+0 , -1%)

CONTROL TRAILER

A. The center of gravity of the loaded control trailer is in the trailer's longitudinal centerline at a height of 66 inches, ± 3 inches above the ground.

B. For a truck-trailer with a rear axle gross axle weight rating of 26,000 lbs or less, the control trailer has a single axle with a gross axle weight rating of 18,000 lbs and a length when measured from the transverse centerline between the axles to the centerline of the kingpin of 390 inches, ± 6 inches.

7. CALIBRATION OF TEST INSTRUMENTS

Before the contractor initiates the safety compliance test program, a test instrumentation calibration system will be implemented and maintained in accordance with established calibration practices. Guidelines for setting up and maintaining such calibration systems are described in MIL-C-45662A, "Calibration System Requirements". The calibration system shall be set up and maintained as follows:

A. Standards for calibrating the measuring and test equipment will be stored and used under appropriate environmental conditions to assure their accuracy and stability.

B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals not to exceed twelve (12) months. Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.

C. All measuring and test equipment and measuring standards will be labeled with the following information:

   (1) Date of calibration

   (2) Date of next scheduled calibration

   (3) Name of the technician who calibrated the equipment

D. A written calibration procedure shall be provided by the contractor, which includes as a minimum the following information for all measurement and test equipment:

   (1) Type of equipment, manufacturer, model number, etc.

   (2) Measurement range

   (3) Accuracy

7. CALIBRATION OF TEST INSTRUMENTS....Continued

(4) Calibration interval

(5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)

E. Records of calibration for all test instrumentation shall be kept by the contractor in a manner, which assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the acceptance of the COTR before the test program commences.

F. Standards for calibrating the measuring and test equipment shall be stored and used under appropriate environmental conditions to assure their accuracy and stability.

8. PHOTOGRAPHIC DOCUMENTATION

STILL PHOTOGRAPHS

The final test report shall have 8" X 10" color photographs that are properly focused for clear images. A tag, label or placard identifying the test vehicle model and NHTSA number shall appear in each photograph and be legible. Each photograph shall be labeled as to subject matter. As a minimum the following photographs shall be included:

A. *Frontal view of the vehicle

B. *Right side view of the vehicle

C. *Left side view of the vehicle

D. *Rear view of the vehicle

E. Vehicle Certification Label Tire information label (if not part of certification label)

F. Service reservoir(s)

G. Supply reservoir(s)

8. PHOTOGRAPHIC DOCUMENTATION....Continued

H. Front and Rear Brake chamber(s) including automatic slack adjusters

I. ABS brake system components

J. All test instrumentation

* at LLVW and GVWR

In the event of a possible nonconformance, additional photographs shall be taken to document the area of concern.

VIDEO COVERAGE

Videotape (8mm or VHS) coverage of the following tests shall be included with each final test report.

*A. Stability and Control

Pan view of the vehicle braking in all FOUR stops for both GVWR and LLVW configurations.

*B. Service Brake

Pan view of one (preferably, the first) of six stops which shows the vehicle met all requirements, OR, all six stops which show the vehicle did not meet all requirements, for each configuration tested under chapter 10 of this test report

*C. Emergency Brake

Pan view of one (preferably, the first) of six stops which shows the vehicle met all requirements, OR, all six stops which show the vehicle did not meet all requirements, for each configuration tested under chapter 10 of this test report

8. PHOTOGRAPHIC DOCUMENTATION....Continued

D. Parking Brake (Grade Holding Only)

Videotape both LLVW and GVWR configurations with the vehicle facing up the grade and the vehicle facing down the grade for the complete 5-minute duration of each test. The first minute shall consist of a close-up view of the area where the “marked” tire contacts the ground. The next three minutes shall consist of a full view of the vehicle on the grade. The final minute shall consist of the view of the tire-to-ground markings with a measurement of vehicle’s translation from the original location, if any.

*** NOTE:** Videotape shall clearly display the vehicle, track and lane markers throughout the duration of the braking run from the onset of the first brake application to the point at which the vehicle stops.

9. DEFINITIONS

AIR BRAKE SYSTEMS

System that uses air as medium for transmitting pressure or force from driver control to service brake, including air-over-hydraulic system, but not including system that uses compressed air or vacuum only to assist driver in applying muscular force to hydraulic or mechanical components.

ANTILOCK BRAKE SYSTEM (ABS)

Portion of service brake system that automatically controls degree of rotational wheel slip during braking by:

A. Sensing rate of angular rotation of wheels

B. Transmitting signals regarding rate of wheel angular rotation to one or more controlling devices, which interpret those signals and generate responsive controlling output signals

C. Transmitting those controlling signals to one or more modulators, which adjust brake-actuating forces in response to those signals.

9. DEFINITIONS....Continued

AUTO TRANSPORTER

Truck and trailer designed for use in combination to transport motor vehicles, in that towing vehicle is designed to carry cargo at location other than fifth wheel and cargo loaded only by means of towed vehicle.

AXLE SYSTEM

Arrangements of wheels that lie across vehicle in line that is perpendicular to longitudinal centerline of vehicle.

BRAKE CHAMBER HOUSING

Case enclosing brake chamber

COMMON DIAPHRAGM

Single brake chamber diaphragm, which is component of parking, emergency and service brake systems

EMERGENCY BRAKE

Mechanism designed to stop a motor vehicle after failure of service brake

FULL BRAKE APPLICATION

Application of brake control (treadle or brake pedal) in which pressure in any of valve's output circuits reaches 85 psi, or brake control has reached maximum displacement, within 0.2 second after application initiated

GROSS AXLE WEIGHT RATING (GAWR)

Value specified by vehicle manufacturer as load-carrying capacity of a single axle system, as measured at tire-ground interfaces

9. DEFINITIONS....Continued

GROSS VEHICLE WEIGHT RATING (GVWR)

Maximum rated capacity of single vehicle. Lift able axles shall be down for GVWR tests. Unless otherwise specified, vehicles loaded to GVWR as follows:

A. Trucks are loaded to GVWR using axle loads proportional to respective gross axle weight ratings (GAWR). In the case where ballast cannot be positioned without exceeding GAWR, reduce amount of ballast so that axle load equals specified GAWR, maintaining load proportioning as closely as possible to specified proportioning.

B. Truck tractors to be loaded to GVWR using single axle unbraked control trailer. Center of gravity of all ballast on control trailer located directly above kingpin. Load distribution to be in proportion to tractor's GAWRs, with trailer axle as close as possible to 4,500 pounds. Adjust load distribution by altering fifth wheel position. In case where tractor fifth wheel cannot be adjusted as specified without exceeding a GAWR, reduce amount of ballast so that axle load equals specified GAWR, maintaining load proportioning as close as possible to specified proportioning.

C. Actual vehicle test weight to be within + 0%, - 2% of the weight specified in A or B. Axle weights to be within ± 2% of their proportional share of test weight. Ballast to be located as close as possible to longitudinal centerline of control trailer or truckload frame.

HEAVY HAULER TRAILER

Trailer with one or more of following characteristics:

A. Brake lines are designed to adapt to separation or extension of vehicle frame; or

B. Body consists only of platform whose primary cargo-carrying surface is not more than 40 inches above ground in unloaded condition, except that it may include sides that are designed to be easily removable and a permanent “front-end structure”.

9. DEFINITIONS....Continued

INITIAL BRAKE TEMPERATURE (IBT)

Average temperature of service brakes on hottest axle of vehicle 0.2 mile before any brake application.

INTERVAL

Distance from start of one stop or snub to start of next stop or snub.

LIGHTLY LOADED VEHICLE WEIGHT (LLVW)

Unloaded vehicle weight (UVW) plus up to 500 pounds (including driver, observer, and instrumentation). Lift able axles shall be lifted for LLVW vehicle tests.

MAXIMUM DRIVE-THROUGH SPEED

Highest possible constant speed at which vehicle can be driven through 200 feet of arc of low Mu 500-foot radius curve without leaving 12 foot wide lane.

MOTOR VEHICLE

Any vehicle driven or drawn by mechanical power manufactured primarily for use on public streets, roads, and highways, except vehicle operated exclusively on rail or rails.

PARKING BRAKE

Mechanism designed to prevent movement of stationary motor vehicle.

PEAK FRICTION COEFFICIENT (PFC)

Ratio of maximum value of longitudinal force to simultaneous vertical force occurring prior to wheel lockup, as braking torque is progressively increased, as measured using procedure in ASTM E 1337.

SNUB

Braking deceleration of vehicle from higher speed to lower speed that is greater than zero.

9. DEFINITIONS....Continued

STOPPING DISTANCE

Distance traveled by vehicle from point of first movement of brake control to point at which vehicle reaches complete stop.

TRAILER CONVERTER DOLLY

Trailer chassis equipped with one or more axles, lower half of a fifth wheel, and drawbar.

TRUCK

Vehicle with motive power designed primarily for transportation of property or special purpose equipment.

TRUCK TRACTOR

Truck designed primarily for towing other vehicles and constructed so as to carry part of weight of vehicle and load that it tows.

UN-BRAKED CONTROL TRAILER

Single axle semi-trailer with GAWR of 18,000 lb and length, measured from transverse centerline of axle to centerline of kingpin, of 258 inches ± 6 inches and ballast CG height less than 24 inches above the top of tractor's fifth wheel and trailer axle weight of 4,500 pounds.

UNLOADED VEHICLE WEIGHT (UVW)

Weight of vehicle with maximum capacity of all fluids necessary for operation of vehicle, but without cargo or occupants.

VEHICLE COMBINATION WEIGHT (VCW)

Combined weight of towing vehicle and vehicle being towed.

WHEEL LOCKUP

100% wheel slip

10. TEST EXECUTION

10.1 VERIFICATION OF REQUIRED EQUIPMENT - Visual Inspections

A. Brake Distribution (S5.1.8, S5.2.2)

Verify that all wheels of the vehicle are equipped with service brakes.

B. Automatic Brake Adjustment (S5.1.8, S5.2.2)

Check that all brakes are equipped with automatic brake adjusters, and if equipped with adjustment indicators, that the indicators are visible from adjacent to or underneath the vehicle.

C. Antilock Brake System (S5.1.6.1, S5.2.3.1)

(1) For truck tractors manufactured after March 1, 1997

(A) Verify that the vehicle is equipped with an ABS system.

(B) Verify from the shop manual or the manufacturer that the wheels of at least one front and one rear axle are directly controlled and that the wheels of at least one axle is independently controlled.

(2) For trucks and buses manufactured after March 1, 1998

(A) Verify that the vehicle is equipped with an ABS system.

(B) Verify from the shop manual or the manufacturer that the wheels of at least one front and one rear axle are directly controlled.

(3) For trailers and trailer converter dollies manufactured after March 1, 1998, verify that the vehicle is equipped with an ABS system

(4) For semi-trailers and trailer converter dollies, verify from the shop manual or the manufacturer that the wheels of at least one axle are directly controlled.

(5) For full trailers, verify from the shop manual or the manufacturer that the wheels of at least one front and one rear axle are directly controlled.

10. TEST EXECUTION....Continued

D. Antilock Malfunction Warning Signal (S5.1.6.2, S5.2.3.2, S5.2.3.3, S5.5.1)

(1) For truck tractors manufactured after March 1, 1997 and for trucks and buses manufactured after March 1, 1998

(A) Turn ignition to "on" or "run" position and check for activation followed by deactivation of the visual signal after ignition is turned on.

(B) Verify that the visible warning signal is in the driver's forward field of view.

(C) Verify from the shop manual or the manufacturer that the vehicle is equipped with an electrical circuit that provides continuous power to the antilock system(s) on any towed vehicles whenever the ignition switch is in the “on” or “run” position.

(2) For truck tractors and single unit vehicles designed to tow another air braked vehicle manufactured after March 1, 2001

(A) Turn ignition to "on" or "run" position and check for activation followed by deactivation of the visual signal for the trailer ABS after ignition is turned on.

(B) Check that the visible warning signal is in the driver's forward field of view.

(C) Verify from the shop manual or the manufacturer that the vehicle is equipped with a circuit that is capable of transmitting a malfunction signal from the antilock system(s) on any towed vehicles.

(3) For trailers and trailer converter dollies manufactured after March 1, 1998 but before March 1, 2009;

Verify that the vehicle is equipped with an external warning indicator lamp and check for activation followed by deactivation of the warning indicator after power is supplied to the ABS system.

10. TEST EXECUTION....Continued

E. Service Reservoir Check (S5.1.2, S5.1.2.4, S5.2.1)

(1) Truck tractors, trucks, and buses

(A) Visually check for one or more service reservoir systems.

(B) Visually check for automatic condensate drain valve for each service reservoir, or a supply reservoir between the service system and the air pressure source.

(C) Visually check for automatic operation of condensate valve, if present, in accordance with manufacturer's specifications. Describe method of operation.

(D) Verify that all reservoirs have a drain valve, which can be manually operated.

(2) Trailers

(A) Visually check for one or more reservoirs to which the air is delivered from the towing vehicle.

(B) Verify that all reservoirs have a drain valve, which can be manually operated.

F. Parking Brake System Control (S5.6.4)

(1) Verify that parking brake control is separate from the service brake control.

(2) Verify that parking brake control is readily accessible to, and operable by, a person seated in the normal driving position.

(3) Check that parking brake control is identified in a manner that specifies the method of control operation.

(4) If the test vehicle is designed to tow another air braked vehicle, check that the parking brake control of the test vehicle operates the parking brakes of the towed vehicle by observing the air pressure at the supply line coupling.

10. TEST EXECUTION....Continued

10.2 LABORATORY TESTS

A. Service Reservoir Pressure Gauge Accuracy, Compressor Cut-in and Cut-out {Truck Tractors, Trucks, and Buses} (S5.1.1.1, S5.1.4)

(1) While seated in the normal driving position and in a normal driving posture, verify that the service brake system pressure gauge is readily visible. Record on data sheet.

(2) Install pressure transducer, with digital readout, as close to the service reservoir of the system to be tested as practical with no leaks in the system.

(3) Exercise the test gauge at least 3 cycles over the entire range up to the compressor cutout pressure before performing the actual calibration.

(4) Build pressure in reservoir system to compressor cutout and record test gauge reading.

(5) Turn off vehicle engine.

(6) Open condensate drain valve in reservoir slightly to slowly decrease pressure. Record vehicle pressure gauge reading and test gauge reading at 20 psi decrements until pressure gauge reaches 10 psi.

(7) Subtract vehicle pressure gauge readings from test gauge pressure readings at each interval. Verify that the vehicle pressure gauge error is less than or equal to +/- 7% of the compressor cut-out pressure recorded in (4). Record on data sheet.

(8) Re-pressurize reservoir system to compressor cut-out.

(9) With engine idling, open condensate drain valve in reservoir slightly to slowly decrease pressure.

(10) Record test gauge reading at compressor cut-in.

(11) Verify that compressor cut-in pressure is 100 psi or greater. Record on data sheet.

10. TEST EXECUTION....Continued

(12) Repeat test with pressure transducer in other service reservoir system.

B. Warning Signal -- Service Reservoir Air Pressure (S5.1.5)

(1) Install pressure transducers in each service reservoir

(2) With engine and ignition “off”, bleed service brake system pressure below 60 psi

(3) Turn ignition to "on" or "run" and check activation of the visible signal, and activation of the audible signal if installed.

(4) While seated in the normal driving position verify that the warning signal is visible within the driver's forward field of view. Record on data sheet.

(5) Start engine and allow the service brake reservoir system pressure to build to compressor cut-out. As the reservoir system pressure rises, verify the deactivation of the visible signal, and if installed, the deactivation of the audible signal at some pressure above 60 psi. Record on data sheet.

(6) Turn off vehicle engine.

(7) After engine rotation has stopped, and prior to the service brake reservoir pressure falling to 60 psi, turn ignition to "on" or “run”.

(8) Slowly bleed the service brake reservoir system pressure. As the system falls, verify the activation of the visible signal and, if installed, the activation of the audible signal. Record pressure at activation.

C. Service Brake Stop Lamp Switch Actuation {Truck Tractors, Trucks, and Buses} (S5.1.7)

(1) Install a transducer to measure service brake chamber air pressure in the chamber closest to the service brake control.

(2) Install instrumentation that is capable of detecting when the stop lamps are energized.

10. TEST EXECUTION....Continued

(3) Slowly depress the service brake control.

(4) Determine the pressure at which stop lights were energized. Record pressure.

(5) Repeat determination while depressing the control rapidly.

(6) Verify that the lamp actuates at a pressure of 6 psi or less. Record on data sheet.

D. Compressor Recharge Rate {Truck Tractors, Trucks, and Buses} (S5.1.1)

(1) Place calibrated transducers in the service reservoirs and pressurize system to cut-out pressure.

(2) Lower pressure in system to 70 psi or less and turn off any air operated accessories.

(3) Operate engine at vehicle manufacturer's maximum recommended RPM (fully depress accelerator).

(4) Determine the time necessary to increase the reservoir pressure from 85 psi to 100 psi.

(5) Repeat tests two additional times.

(6) Determine and record average of the three time measurements.

(7) Calculate the Required Reservoir Capacity by multiplying twelve (12) times the combined volume of the brake chambers.

(8) Determine the Required Reservoir Capacity from the Service Reservoir Volume Test

(9) Verify that average time to increase the air pressure in the reservoirs is less than or equal to:

(Actual Reservoir Capacity x 25) / (Required Reservoir Capacity)

(10) Record on data sheet.

10. TEST EXECUTION....Continued

E. Reservoir Volume (S5.1.2.1, S5.2.1.1)

(1) The volume of one of each type of reservoir will be determined

(2) Fill the reservoir completely with water at 100 psi and weigh.

(3) Empty the water and weigh again. Take care that all water is removed

(4) Determine the volume of the reservoir (27.7 cubic inches per pound).

(5) Record identification numbers.

(6) Based on the number of each type of reservoir, determine total reservoir volume.

The volume of at least one of each type or size of brake chamber will be determined. Use table shown on the data sheet if possible. If not:

(1) Fill the brake chamber with water at a pressure of 100 psi and weigh.

(2) Completely empty the brake chamber of water.

(3) Determine the volume of the brake chamber.

(4) Record identification numbers.

(5) Based on number of each type of chamber, determine total chamber volume.

(6) Determine ratio of total reservoir volume to total chamber volume.

(7) Verify the following:

(A) For truck tractors, trucks, and buses the ratio of total reservoir volume to total chamber volume shall be equal to or greater than 12.

10. TEST EXECUTION....Continued

(B) For trailers, the ratio of total reservoir volume to total chamber volume shall be equal to or greater than 8.

F. Service Reservoir Hydrostatic Test (S5.1.2.2, S5.2.1.2)

NOTE: Since this test is potentially a destructive test, proper safety precautions should be observed. Consult the COTR for disposition of test reservoirs. Proper shielding of the test reservoir is recommended in the event the reservoir should rupture during the test. Under no circumstances should the reservoirs be placed in service on a vehicle.

At least one of each reservoir size and type not identified by the same part number will be tested. If the reservoir has multiple compartments, all compartments will be pressurized at the same time.

(1) Determine test pressure

(A) For truck tractors, trucks and buses:

(i) Determine the compressor cutout pressure

(ii) If compressor cutout pressure times 5 is greater that 500, use this pressure for tests. Otherwise, use 500 psi.

(B) For trailers and converter dollies use 500 psi.

(2) Record part number.

(3) Measure the reservoir circumference at a minimum of three locations along the longitudinal axis of the reservoir tank.

(4) Hydrostatically pressurize reservoir at an average pressurization rate between 1 psi/sec and 5 psi/sec until test pressure is reached or reservoir is ruptured.

(5) Maintain test pressure for 10 minutes, and then relieve pressure.

(6) Measure reservoir circumference at the same three locations defined previously.

10. TEST EXECUTION....Continued

(7) Record on the data sheet, any increase in circumference, evidence of stress, leaks, rupture, or loss of pressure.

(8) Verify whether permanent circumferential deformation exceeds 1% or pressure loss exceeds 5 psi. Record on data sheet.

G. Service Reservoir System Air Loss Test (S5.1.2.3, S5.2.1.4)

(1) Locate check valve or equivalent devices to protect reservoirs from air loss.

(2) Fully charge air reservoir system

(A) For truck tractors, trucks and buses, charge system to compressor cut-out pressure

(B) For trailers, charge system to 100 psi

(3) Record pressure in each service reservoir system

(4) Check for proper functioning of reservoir protection device

(A) For Truck tractors, trucks, and buses, follow the manufacturer's recommendation for checking the check valve or equivalent device for proper function without disconnecting any air line or fitting. Describe method and technique used.

(B) For Trailers, disconnect the supply line coupling.

(5) Record pressure in each service reservoir system after 10 minutes.

(6) Verify that the pressure drop is less than or equal to 10 psi after 10 minutes.

H. Towing Vehicle Protection System {Vehicles Designed to Tow Another Air Braked Vehicle} (S5.1.3)

(1) Connect vehicle to a trailer or a simulated trailer.

(2) Open condensate drain valves until all reservoirs are empty.

10. TEST EXECUTION....Continued

(3) Install pressure transducers in the service reservoirs of the towing vehicle and the trailer.

(4) Start engine and allow air pressure to build up to the compressor cut-out pressure. Record this value.

(5) Fully open a condensate drain valve(s) in the trailer. Record towing vehicle pressure as pressure in the trailer drops.

I. Brake Actuation and Release Timing (S5.3.3, S5.3.4)

(1) For vehicles designed to tow another vehicle equipped with air brakes, install a 50 in^3 reservoir connected to the rear control line coupling.

(2) For vehicles equipped with an antilock system, provide power to the antilock system.

(3) Install a pressure sensing device and instrumentation to determine the time to reach a given pressure in the test vehicle braking system at the chamber under test. All plumbing associated with this installation should be as short as possible. Restrictions, sharp bends in lines, or any plumbing techniques, which cause unnecessary changes in the flow path of the air to the pressure sensor, must be avoided. After the pressure sensing device has been installed, a leak check should be performed and all leaks corrected.

(4) Pressurize system to a reservoir pressure of 100 psi

(5) Measure apply and release times for at least one chamber on each axle and, for vehicles designed to tow another vehicle equipped with air brakes, for the 50 in^3 reservoir.

(A) For truck tractors, trucks, and buses

(i) Install a device to detect the first movement of the test vehicle brake control in such a manner that its operation does not affect the operation of the brake control.

10. TEST EXECUTION....Continued

(ii) Depress service brake control as rapidly as practical with operator's foot and measure time from first movement of the brake control until the brake chamber pressure reaches 60 psi.

(iii) Continue to hold the brake control until the chamber reaches 95 psi.

(iv) Once the pressure in the chamber has achieved 95 psi, release brake control as rapidly as practical and measure time from the first movement of the brake control until the brake chamber pressure drops to 5 psi.

(B) For trailers and converter dollies:

(i) Connect supply and control couplings to trailer test rig shown in Figures 1 and 1A.

(ii) Apply service brakes and measure time from first movement of the brake control valve until the chamber pressure reaches 60 psi.

(iii) Continue to apply the brake until the chamber reaches 95 psi.

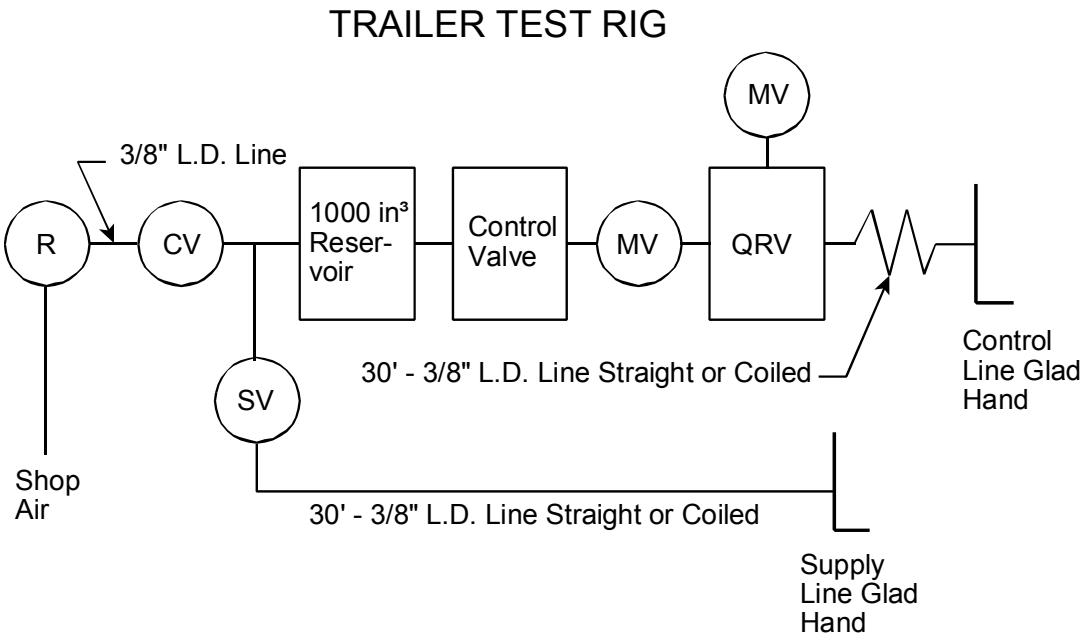
(iv) Once the pressure in the chamber has achieved 95 psi, release service brakes and measure time from first movement of the brake control valve until the chamber pressure drops to 5 psi. Refer to Figure 2.

© Repeat application and release an additional two times, ensuring the reservoirs are completely recharged per (d) between applications.

(6) If the test vehicle is equipped with an antilock system, it shall also be tested under each of the following conditions (test to be performed not less than 10 seconds after inducing described conditions):

(A) Without primary power to the antilock system.

10. TEST EXECUTION….Continued



SV - Shut-off Valve
R - Regulator (set at 100 psi for actuation tests and 95 psi for release test)
CV - Check Valve
MV - Metering Valve (variable or fixed)
QRV- Quick Release Valve

FIGURE 1

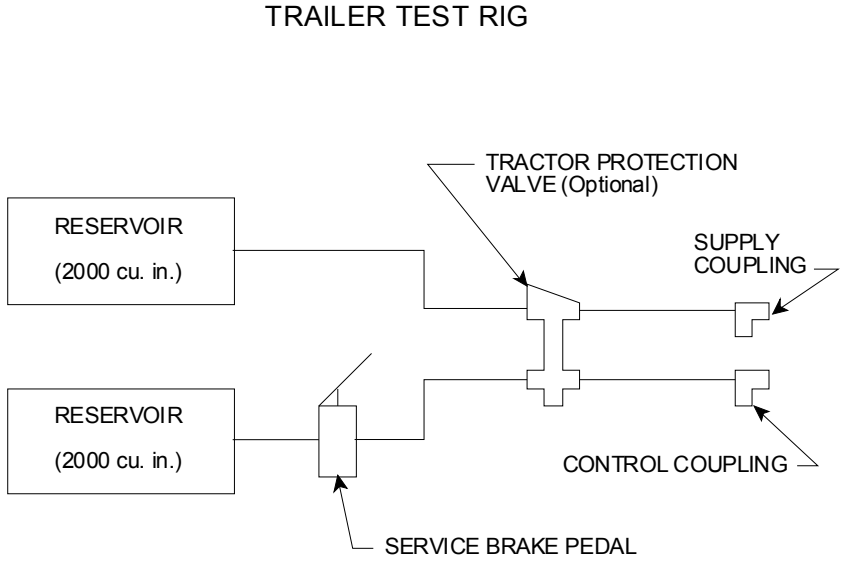


FIGURE 1A

10. TEST EXECUTION….Continued

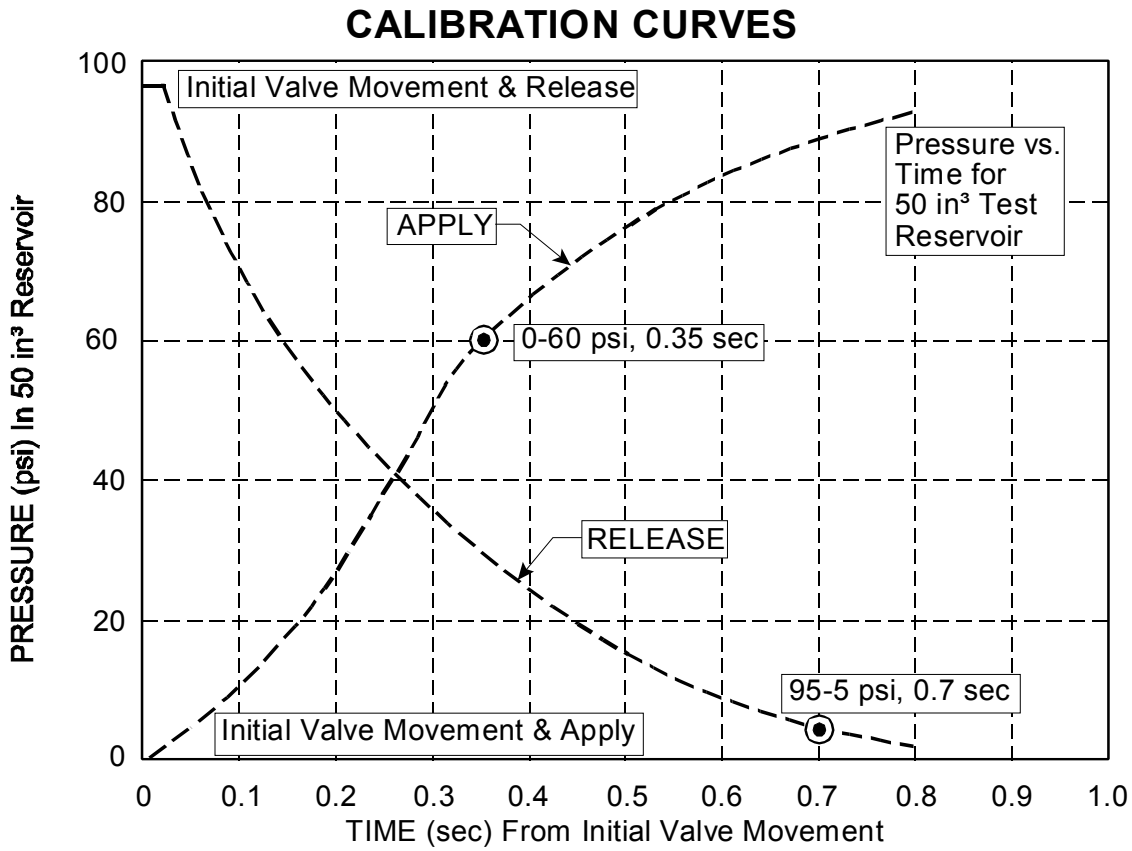


FIGURE 2

(B) With the antilock control valve rendered inoperative by means of the wheel speed sensor open circuited and short circuited.

(7) Requirements:

Verify the following:

Brake Actuation Time (S5.3.3)

Trucks and Buses

10. TEST EXECUTION....Continued

Brake Chamber
• Application: 0.45 sec
• Release: 0.55 sec

50 in^3 Reservoir
• Application: Not later that the fastest brake chamber or not more than 0.35 (at the option of the manufacturer).
• Release: 0.75 sec

Trailers Not Designed to Tow Another Vehicle

Brake Chamber
• Application: 0.50 sec
• Release: 1.00 sec

Trailer Converter Dollies

Brake Chamber
• Application: 0.55 sec
• Release: 1.10 sec

50 in^3 Reservoir
• Application: Not later that the fastest brake chamber or not more than 0.55 (at the option of the manufacturer).
• Release: 1.10 sec

Trailers Designed to Tow Another Vehicle

Brake Chamber
• Application: 0.60 sec
• Release: 1.20

50 in^3 Reservoir
• Application: Not later that the fastest brake chamber or not more than 0.50 (at the option of the manufacturer).
• Release: 1.00 sec

10. TEST EXECUTION....Continued

J. Control Signal Pressure Differential {Converter Dollies and Trailers Designed to Tow Another Vehicle Equipped with Air Brakes} (S5.3.5)

(1) Secure a means of inserting 0.032 inch thick disc with a fixed orifice of 0.0180 (no. 77 drill bit) in the control line between the trailer test rig (Figures 1 and 1A) coupling and the vehicle's control line input coupling. Trailer test rig is to be connected to air source with the regulator set to 100 psi throughout test.

(2) Connect a 50 in^3 reservoir to the output control line coupling.

(3) Place a transducer in the 50 in^3 reservoir and in the input control line coupling.

(4) Pressurize the system so that all reservoirs are at 100 psi.

(5) Apply vehicle brakes using trailer test rig until pressure in 50 in^3 reservoir achieves 95 psi, then release brakes, continuously recording pressures throughout the application and release.

(6) Requirement:

Verify the following:

The differential between the input and output pressure shall —

(A) Not exceed 1 psi for input pressures between 5 and 20 psi

(B) Not exceed 2 psi for input pressures between 20 and 40 psi

(C) Be between 0.95 times the input pressure and 1.05 times the input pressure for input pressures equal to or greater than 40 psi

K. Parking Brake System Application and Holding (S5.6.3.2)

(1) Induce loss of air pressure in service brake system(s) by opening a manual condensate drain valve.

10. TEST EXECUTION....Continued

(2) Verify that the parking brakes are held in the applied position solely by mechanical means. (Note: Do not disconnect any air or brake fluid line to perform this check. The manufacturer's shop manual description of the system and a visual inspection to assure that the system installed is in fact the system described will suffice).

L. Parking Brake Accumulation of Actuation Energy (S5.6.6)

(1) Jack one wheel, which has a brake equipped with a parking brake, off of the floor so that the wheel may be turned by hand.

(2) If the vehicle is designed to tow another vehicle equipped with air brakes, connect a 50 in^3 reservoir to the rear supply line coupling.

(3) Pressurize reservoir system

(A) For trucks, truck tractors, and buses, build air pressure in the system until the reservoir system pressure is above 100 psi, then turn engine off.

(B) For trailers use the supply line portion of the trailer test rig (see Figures 1 and 1A) to pressurize the supply line to 100 psi

(4) Induce loss of air pressure in service brake system by opening a manual condensate valve in one service reservoir.

(5) Apply parking brake

(A) For trucks, truck tractors, and buses, actuate parking brake control.

(B) For trailers, vent front supply line coupling to atmosphere.

(6) Verify that the parking brakes have applied by noting that the wheel is no longer free to rotate. Record on data sheet.

(7) Thirty (30) seconds after initiation of parking brake application, release parking brake.

10. TEST EXECUTION....Continued

(8) Verify that the parking brakes have released by noting that the wheel is free to rotate. Record on data sheet.

(9) Thirty (30) seconds after initiation of parking brake release, reapply parking brake.

(10) Verify that the parking brakes have applied by noting that the wheel is no longer free to rotate. Record on data sheet.

(11) Fail other reservoir and repeat test

M. Modulated Emergency Braking System {Truck Tractors, Trucks, and Buses} (S5.7.2, S5.7.3(c))

(1) Start engine and allow the service brake reservoir system pressure to build to compressor cut-out pressure.

(2) With engine “off”, open condensate valve on one of the service reservoirs until pressure in that reservoir reaches zero.

(3) Apply and release service brake control and verify that the emergency brakes apply and release. Record on data sheet.

(4) For vehicles designed to tow another air braked vehicle - Monitor the pressure at the control and supply line couplings to verify that the brakes on any towed vehicle equipped with air brakes would apply and release with the service brake control. Record on data sheet.

(5) Fail other service reservoir and repeat test.

N. Emergency Braking System {Trailer Converter Dolly} (S5.8.1(b))

(1) Verify that the trailer converter dolly has a parking brake system. Record on data sheet.

(2) If it does not have a parking brake system:

(A) Pressurize the reservoirs to 20 psi.

10. TEST EXECUTION....Continued

(B) Vent the supply line coupling to atmosphere.

(C) Verify that the service brakes apply. Record on data sheet.

O. Parking Brake System Automatic Application {Trailers} (S5.8.3)

(1) Jack one wheel, which has a brake equipped with a parking brake, off of the floor so that the wheel may be turned by hand.

(2) If trailer is designed to tow a vehicle equipped with air brakes, install a 50 in^3 reservoir to the rear supply line coupling.

(3) Install a pressure transducer or gauge in the front supply line coupling.

(4) Install a pressure regulator between the air source and the front supply line coupling.

(5) Pressurize supply line and allow reservoir pressure to build to, and stabilize at, 100 psi.

(6) Set the pressure regulator at 70 psi.

(7) Induce loss of air pressure in service brake system(s) by opening a manual condensate drain valve in one service reservoir.

(8) Verify that the wheel is free to rotate for all pressures above 70 psi in the supply line. Record on data sheet.

10.3 ROAD TESTS

A. General Test Conditions

(1) Ambient air temperature must be between 32 and 100 F

.

(2) Wind velocity shall not exceed 15 mph. Stops must not be made with a tail wind component in excess of 5 mph.

(3) All vehicle openings (doors, windows, hood, etc.) must be closed except as required for instrumentation purposes.

10. TEST EXECUTION....Continued

(4) Unless otherwise specified, the brake control can be applied and modulated at any desired rate.

(5) For truck tractor tests that utilize the control trailer, a 50 in^3 reservoir shall be attached to the tractors control glad-hand. Tractor protection valve to be in the bobtail position for bobtail tests and the towing position for towing the control trailer.

(6) Except for the parking brake grade holding test, the roadway shall be flat with no more than a 1% grade in all directions, including crown.

(7) Tires must be inflated to the pressure specified by the vehicle manufacturer for the gross vehicle weight rating, measured cold (at the beginning of each test day).

(8) The IBT must be between 150°F and 200°F for each stability and control, service and emergency stop. Brake temperature just prior to any parking brake test must be between 150°F and 200°F. Warm brakes to the required temperature by making 40 to 20 mph snubs at 10 ft/sec^2.

(9) Automatic adjusters must remain activated for the duration of the test.

(10) Brakes may be adjusted, per the vehicle manufacturer's procedure, at specified points in the test sequence.

(11) Individual brake lining temperatures should be less than 200°F when being adjusted or checked.

(12) The air system reservoir pressure must be at compressor governor cut-out pressure (+0/-10 psi) within 0.2 miles before the beginning of any stability and control and service or emergency brake stop or just prior to any parking brake test.

(13) Vehicles equipped with an interlocking axle system or front wheel drive system capable of being manually engaged by the driver, shall be tested with the system disengaged.

10. TEST EXECUTION....Continued

(14) Any auxiliary braking device (driveline retarders) capable of being manually engaged by the driver, shall be tested with the auxiliary device(s) both engaged and disengaged for the stability and control, service and emergency tests.

(15) The driver may steer as necessary to stay within the lane.

(16) Vehicle speed is to be +0, -2 mph of the specified test speed.

B. Test Sequence (S5.3.1)

TRUCK TRACTORS

(1) Burnish

(2) Stability and control test at GVWR

(3) Stability and control test at LLVW

(4) Manual brake adjustment allowed

(5) Service brake stopping distance test at GVWR

(6) 20% grade holding test at GVWR

If vehicle fails to hold on the grade, conduct a Draw Bar Pull test at GVWR

(7) Manual brake adjustment allowed

(8) Service brake stopping distance tests at LLVW

(9) Emergency brake stopping distance tests at LLVW

(a) Primary reservoir failure

(b) Secondary reservoir failure

(c) Primary control line failure

(d) Trailer control and supply line failure for truck trailers

10. TEST EXECUTION....Continued

(10) 20% grade holding tests at LLVW

If vehicle passed the grade holding test at GVWR, but fails to hold on the grade at LLVW, conduct a static retardation test at GVWR

(11) Final inspection

TRUCKS AND BUSES

(1) Burnish

(2) Service brake stopping distance tests at GVWR

(3) Emergency brake stopping distance tests at GVWR

(a) Primary reservoir failure

(b) Secondary reservoir failure

(c) Primary control line failure

(4) 20% grade holding test at GVWR

If vehicle fails to hold on the grade, conduct a static retardation test at GVWR

(5) Manual brake adjustment allowed

(6) Service brake stopping distance tests at LLVW

(7) Emergency brake stopping distance tests at LLVW

(a) Primary reservoir failure

(b) Secondary reservoir failure

(c) Primary control line failure

(8) 20% grade holding tests at LLVW

If vehicle passed the grade holding test at GVWR, but fails to hold on the grade at LLVW, conduct a static retardation test at GVWR

(9) Final inspection

10. TEST EXECUTION....Continued

C. Burnish (TRUCK TRACTORS, TRUCKS, AND BUSES) (S6.1.8)

(1) Road conditions should be dry. Slightly wet is permissible but discontinue burnish when noticeable splash and spray occurs.

(2) Install brake lining thermocouples (see Figure 3)

(3) Install thermocouple readout, decelerometer, and speed measurement device.

(4) Load vehicle to GVWR so that wheels do not lock during burnish snubs. (Truck tractors shall be loaded by coupling to an un-braked trailer. The vehicle combination weight shall equal the GVWR of the truck tractor. The ballast on the un-braked trailer shall be located so that the truck tractor's wheels do not lock during burnish snubs.)

(5) Adjust brakes per the vehicle manufacturer's recommendation.

(6) Burnish the brakes by making 500 snubs between 40 mph and 20 mph;

(A) Maintain a deceleration rate of 10 ft/sec^2, or at the vehicle's maximum deceleration rate if less than 10 ft/sec^2, with transmission in gear appropriate for speed. (If provided, switch able retarders should be in off position.)

(B) Except where an adjustment is indicated, after each brake application accelerate to 40 mph and maintain that speed until making the next brake application at a point 1 mile from the initial point of the previous brake application. If the vehicle cannot attain a speed of 40 mph in 1 mile, continue to accelerate until the vehicle reaches 40 mph or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first.

10. TEST EXECUTION....Continued

(7) The brakes may be adjusted as specified by the vehicle manufacturer up to three times during the burnish procedure.

(8) Driver Breaks

(A) Driver breaks during the procedure should be minimized and recorded on the data sheets.

(B) Driver breaks should not occur within any 25 snub sequence.

(C) Each 25th snub can be a complete stop in order to record data.

(9) Test Data Recording

Brake lining temperatures and brake application pressure to maintain a 10 ft/sec^2 deceleration should be recorded at each 25th brake snub.

(10) Adjust brakes at the conclusion of the burnishing, in accordance with the vehicle manufacturer's recommendation. Record adjustment data on data sheets.

D. Stability and Control {Truck Tractors} (S5.3.6)

(1) Test Track

(A) Install vertical markers (such as cones) on a 20 ft spacing with the inside edge of the markers placed on the 12 ft wide lane boundaries.

(B) Begin water delivery to ensure a wet surface during the test.

10. TEST EXECUTION....Continued

(2) Instrumentation and equipment

(A) Adjust vehicle weight to appropriate load condition as per test sequence. For the lightly loaded tests, an additional 1000 lb can be allotted for vehicles that require a roll bar.

(B) Install fifth wheel or other speed measuring device.

(C) Install trigger switch to measure (detect) start of braking (first brake control movement).

(D) Install Pressure transducer to measure brake primary control line pressure or device to measure full displacement of brake control.

(E) Install recording device to record start of braking and primary control line pressure (or full brake control displacement) as a function of time.

(3) Maximum drive-through speed and braking speed determination

(A) Starting with the vehicle in the center of the lane, attempt to drive through the curved 500 ft radius low Mu test lane at a constant speed.

(B) Increase or decrease speed in subsequent runs as necessary until the maximum drive-through speed is determined to the nearest whole mph increment. Do not exceed 40 mph.

(C) Verify maximum drive-through speed at least once by repeating runs at 1 mph above the previously determined value.

(D) Take 75% of the maximum drive-through speed and round this value to the nearest whole mph increment to determine test speed for braking runs.

10. TEST EXECUTION....Continued

TYPICAL PLUG TYPE THERMOCOUPLE INSTALLATION

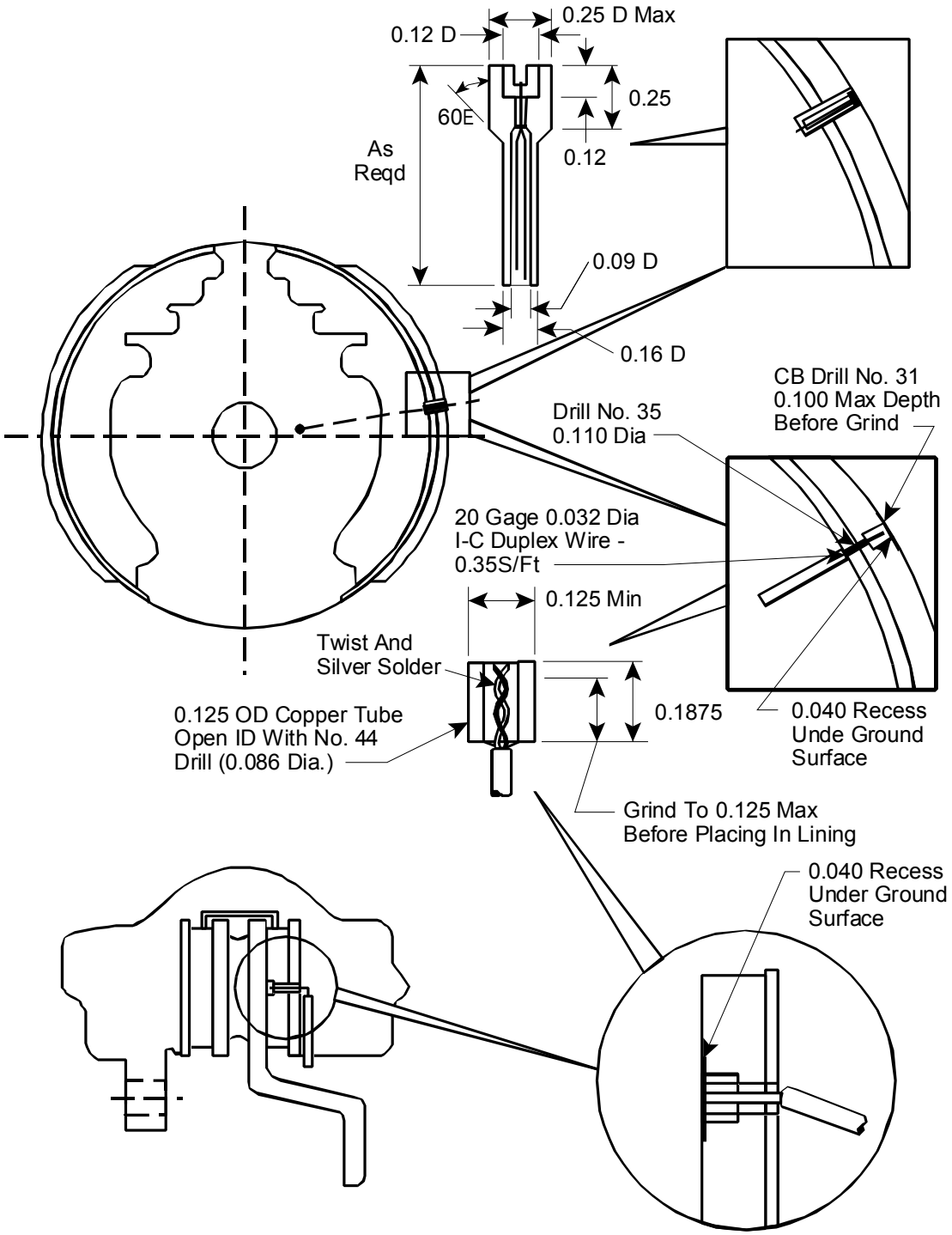


FIGURE 3

10. TEST EXECUTION....Continued

(4) Braking Runs

(A) Starting with the vehicle in the center of the lane, make four full brake application stops from the test speed determined in the previous step.

(B) Make the brake applications after the front end of the vehicle has traveled at least 60 ft in the curved lane on the test surface.

(C) Vehicle speed at which the brakes are applied should be within - 1.0 to +0.5 mph of the test speed.

(D) Repeat braking runs with manual controlled driveline retarder(s) in other position (on/off).

(5) Requirement

Verify that the vehicle remained within the 12-foot lane without any part of the vehicle leaving the roadway in at least three of the four runs. Record on data sheet.

E. Service Brake Stopping Distance Test (S5.3.1.1)

(1) Instrumentation and Equipment

(A) Install device to measure or monitor individual wheel lock-up.

(B) Install pressure gauge/transducer to measure brake control line pressure.

(C) Install device to measure speed at first movement of brake control and distance from first movement of brake control until vehicle stops.

(D) Install instrumentation to display brake temperatures to driver.

(E) Adjust vehicle weight to appropriate load condition as per test sequence.

10. TEST EXECUTION....Continued

(2) Braking Runs

(A) Conduct six stops from 60 mph trying to achieve the shortest stopping distance while maintaining the vehicle within the lane (if the speed attainable in 2 miles is less than 60 mph, the stops will be made from a speed that is a multiple of 5 which is 4 to 8 mph less than the speed attainable in 2 miles)

(B) Repeat the test with manual controlled driveline retarders in other position (on/off).

(3) Wheel Lockup Provisions

(A) At vehicle speeds above 20 mph, any wheel on a non-steer able axle other than the two rearmost non-lift able, non-steer able axles may lock up for any duration.

(B) At vehicle speeds above 20 mph, one wheel on any axle or two wheels on any tandem may lock up for any duration.

(C) At vehicle speeds above 20 mph, any wheel not permitted to lock above in (A) or (B) may lock up repeatedly, with each lockup occurring for a duration of 1 second or less.

(D) At vehicle speeds of 20 mph or less, any wheels may lock up for any duration.

(4) Requirement

Verify that the stopping distance for at least one stop shall be not more than the distance specified in the appropriate column of Table 1.

F. Emergency Brake Stopping Distance Test (S5.7.1)

(1) Instrumentation and Equipment

(A) Install a solenoid valve in largest port in the appropriate air reservoir.

B) Install a pressure gauge/transducer to measure brake control line pressure.

10. TEST EXECUTION....Continued

(2) Conduct 6 stops from 60 mph while trying to achieve the shortest stopping distance while maintaining the vehicle in the lane (If the vehicle speed attainable in 2 miles is less than 60 mph, the vehicle shall stop from a speed which is a multiple 5 mph between 20 and 60 mph, that is 4 to 8 mph less than the speed attainable in 2 miles)

(A) Activate the solenoid valve to vent pressure to atmosphere

(B) Initiate the stop within 5 seconds after the low pressure warning is activated

(3) Repeat the test with manual controlled driveline retarders in other position (on/off)

(4) Repeat for the other reservoir system

(5) Repeat with the solenoid in the trailer supply line and the trailer control line vented to atmosphere for trucks other than truck tractors that are also towing vehicles (GVWR only).

(6) Repeat with the control line to the rear vented to atmosphere at the brake control valve.

(7) Requirement

Verify that the stopping distance for at least one stop shall be not more than the distance specified in the appropriate column of Table 1.

10. TEST EXECUTION....Continued

TABLE 1
STOPPING DISTANCE REQUIREMENTS

Vehicle Speed (mph)	Service Brake Stopping Distance				Emergency Brake Stopping Distance	
	Loaded and Unloaded Busses	Loaded Single Unit Trucks	Unloaded Truck Tractors and Single Unit Trucks	Loaded Truck Tractors	All Vehicles Except Truck Tractors	Unloaded Truck Tractors
20	32	35	38	40	83	85
25	49	54	59	62	123	131
30	70	78	84	89	170	186
35	96	106	114	121	225	250
40	125	138	149	158	288	325
45	158	175	189	200	358	409
50	195	216	233	247	435	504
55	236	261	281	299	520	608
60	280	310	335	355	613	720

G. Parking Brake Chamber Application Pressure

(1) Determine parking brake chamber application pressure

(2) Install pressure transducers in parking brake chambers.

(3) Install device to indicate first movement of parking brake control.

(4) For vehicles designed to tow a vehicle equipped with air brakes, install a 50 in^3 reservoir to the rear supply line coupling.

(5) Pressurize reservoirs to 100 psi

10. TEST EXECUTION....Continued

(6) Actuate parking brake control and record pressure at parking brake chambers three seconds after actuation of control.

(7) Use the parking brake chamber pressure recorded after three seconds in the appropriate parking brake test (static retardation force or grade holding). If the pressure after three seconds is less than or equal to 3 psi, use a pressure of 0 psi.

H. Static Retardation Force Test (S5.6.1)

(1) Install pull device, load cell, and wheel rotation measuring device or method.

(2) If parking brake chamber pressure was greater than 3 psi, install a pressure regulator and a method of supplying air at the recorded pressure to the parking brake chambers to be tested.

(3) Position vehicle on level dry Portland cement concrete or equivalent surface in line with pull cable.

(4) Connect pull cable and force measuring device so that cable is level within ±5 degrees.

(5) Mark circumference of tires on braked wheels at point of tire/ground contact and at 90, 180, and 270 degrees from that point.

(6) Disable parking brake chambers on axle(s) other than the axle being tested.

(7) Throughout sequence, warm brakes as necessary to achieve specified IBT.

(8) Place vehicle transmission in neutral.

(9) Charge brake system reservoirs to compressor governor cut-out pressure.

(10) Turn engine off.

10. TEST EXECUTION....Continued

(11) Apply parking brakes.

(12) Pull vehicle forward at a maximum rate of 4 ft/min until the wheel rotates 90 degrees. Release parking brakes.

(13) Repeat steps (8) through (12) starting from 90, 180, and 270 degrees of wheel rotation.

(14) Repeat (8) through (12) except pull the vehicle in the rearward direction.

(15) Record peak pull force for each 90 degrees of wheel rotation.

(16) Requirement

(A) For vehicles other than a truck tractor that is equipped with more than two axles, the quotient —

$$\frac{(\text{StaticRetardationForce})}{(\text{GAWR})}$$

shall not be less than 0.28 for any axle other than a steer able front axle.

(B) For truck tractors equipped with more than two axles, the quotient —

$$\frac{(\text{StaticRetardationForce})}{(\text{GAWR})}$$

shall not be less than 0.14.

I. Grade Holding Test (S5.6.2)

NOTE: The weight of the truck-tractor/test trailer combination (GCW) is GREATER than the tractor GVWR. If the combination will not park on the test grade at the GCW, reduce the weight to equal truck-tractor GVWR and retest.

(1) Install device to measure vehicle movement on the grade.

10. TEST EXECUTION....Continued

(2) If the parking brake chamber pressure was greater than 3 psi, install a pressure regulator and a method of supplying air at the recorded pressure to the parking brake chambers to be tested.

(3) Warm brakes, as necessary, to achieve specified IBT.

(4) Charge brake system reservoirs to compressor governor cutout pressure.

(5) Ascend 20% grade (+0%,-1%) of dry smooth Portland cement concrete or equivalent surface.

(6) Apply and hold service brakes to minimum level necessary to hold vehicle stationary.

(7) Place vehicle transmission in neutral

(8) Turn engine off

(9) Apply parking brakes

(10) Release service brakes

(11) Record initial movement of vehicle, if any, that takes place after release of service brakes until vehicle becomes stationary.

(12) Record vehicle movement, if any, on grade after 5 minutes.

(13) Repeat the test with the vehicle descending the grade.

J. For Vehicles with a Common Diaphragm (S5.6.7)

(1) Install instrumentation necessary for appropriate parking brake test (i.e., static retardation force or grade holding).

(2) Install pressure transducers at all service reservoirs.

(3) Install a tee in the air line supplying the brake chamber such that two legs of the tee connect the air supply with the chamber and the third leg is vented to the atmosphere through a metering valve.

10. TEST EXECUTION....Continued

(4) For vehicles designed to tow a vehicle equipped with air brakes, install a 50 in^3 reservoir on the rear supply line

(5) Set vehicle parking brakes and reduces pressures in all reservoirs to zero.

(6) Partially open the metering valve to induce a leak in the system.

(7) Attempt to release parking brakes.

(A) For truck tractors, trucks, and buses, run engine at idle and hold parking brake control in release position.

(B) For trailers, connect the trailer's front supply line coupling to the trailer test rig supply line coupling with the trailer test rig regulator set at 100 psi.

(8) Adjust leakage rate

(A) If parking brakes release, adjust metering valve to increase rate of leakage.

(B) If parking brakes do not release and the reservoir pressures have stabilized, adjust metering valve to decrease rate of leakage. Pressures can be considered stabilized if pressure change is less that 2 psi in one minute.

(9) Repeat (5) through (8) until maximum leak rate at which brakes can be released is established.

(10) Fully pressurize system (compressor cut-out for truck tractors, trucks, and buses; 100 psi for trailers)

(11) Apply parking brakes and remove air source, recording reservoir pressures until pressures reach zero.

(A) For truck tractors, trucks, and buses, turn engine off and apply parking brake control.

(B) For trailers, vent front supply line coupling.

10. TEST EXECUTION....Continued

(12) Determine and record leakage rate in psi per minute by dividing 90 by the number of minutes (measured to the nearest 0.01) that elapsed from the time the reservoir pressure was 95 psi until the reservoir pressure was 5 psi.

(13) Adjust metering valve to increase leakage rate. Repeat (10) through (12) until a leak rate of three times the level determined in step (9) has been established.

(14) Without changing metering valve, conduct appropriate parking brake test (i.e., static retardation force or grade holding).

K. Final Inspection

(1) Inspect brake system for structural integrity.

(2) Verify that all brakes lines are connected and brakes operate

(3) Verify brake adjustment is within manufacturers limits.

APPENDIX A

REPORT COVER PAGES FORMAT

FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

(1) Final Report Number such as 121V-ABC-0X-001, where:

121V is the FMVSS tested (separate Test Procedure for S121D)
ABC are the initials for the test laboratory
0X is the Fiscal Year of the test program (of 9X before year 2000)
001 is the Group Number (001 for the 1st test, 002 for the 2nd test, etc.)

(2) Final Report Title And Subtitle such as:

SAFETY COMPLIANCE TESTING FOR FMVSS 121V
Air Brake Systems
* * * * * * * * * * * * * * * * * * *
Name of Vehicle Manufacturer
Model Year, Make and Model of Vehicle
NHTSA Vehicle No. or Test Number

(3) Contractor's Name and Address such as:

COMPLIANCE TESTING LABORATORIES, INC.
4335 West Dearborn Street
Detroit, Michigan 48090

NOTE: DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (3) AND (4)

(4) Date of Final Report completion

(5) The words "FINAL REPORT"

APPENDIX A....Continued

(6) The sponsoring agency's name and address as follows:

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Safety Assurance
Office of Vehicle Safety Compliance
400 Seventh Street, SW
Room 6111 (NSA-30)
Washington, DC 2059

FIRST PAGE AFTER FRONT COVER

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Prepared By: _____

Approved By: _____

Approval Date: _____

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: _____

Acceptance Date: _____

APPENDIX A....Continued

SECOND PAGE AFTER FRONT COVER

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Block 1 — REPORT NUMBER
121V-ABC-9X-001 or 121V-ABC-0X-001 (after year 1999)

Block 2 — GOVERNMENT ACCESSION NUMBER
Leave blank

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Block 4 — TITLE AND SUBTITLE
Final Report of FMVSS 121V Compliance Testing of 200X Ace Truck, NHTSA No. CX0701

Block 5 — REPORT DATE
March 1, 200X

Block 6 — PERFORMING ORGANIZATION CODE
ABC

Block 7 — AUTHOR(S)
John Smith, Project Manager
Bill Doe, Project Engineer

Block 8 — PERFORMING ORGANIZATION REPORT NUMBER
ABC-DOT-XXX-001

Block 9 — PERFORMING ORGANIZATION NAME AND ADDRESS
ABC Laboratories
405 Main Street
Detroit, MI 48070

Block 10 — WORK UNIT NUMBER
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APPENDIX A....Continued

Block 11 — CONTRACT OR GRANT NUMBER
DTNH22-0X-D-12345

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Block 13 — TYPE OF REPORT AND PERIOD COVERED
Final Test Report
Feb. 15 to Mar. 15, 200X

Block 14 — SPONSORING AGENCY CODE
NSA-30

Block 15 — SUPPLEMENTARY NOTES
Leave blank

Block 16 — ABSTRACT
Compliance tests were conducted on the subject axle assembly in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-121V-OX for the determination of FMVSS 121V compliance. Test failures identified were as follows:

None

NOTE: Above wording must be shown with appropriate changes made for a particular compliance test. Any questions should be resolved with the COTR.

Block 17 — KEY WORDS
Compliance Testing
FMVSS 121V

APPENDIX A....Continued

Block 18 — DISTRIBUTION STATEMENT
Copies of this report are available from —
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Block 19 — SECURITY CLASSIFICATION OF REPORT
Unclassified

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APPENDIX B
LABORATORY NOTICE OF TEST FAILURE TO OVSC

FMVSS NO.: 121V TEST DATE: _____

LABORATORY: _____

CONTRACT NO.:_____ DELV. ORDER NO: _____

LABORATORY PROJECT ENGINEER'S NAME: _____

TEST SPECIMEN DESCRIPTION: _____

_____

VEHICLE NHTSA NO.:_____ VIN: _____

PART NO.:_____ MFR: _____

TEST FAILURE DESCRIPTION: _____

_____

_____

FMVSS REQUIREMENT, PARAGRAPH S___; _____

_____

_____

NOTIFICATION TO NHTSA (COTR): _____

DATE:_____ BY: _____

REMARKS:

APPENDIX C
DATA SHEETS FOR VEHICLE TESTS
DATA SHEET 1
VEHICLE INFORMATION SHEET

Vehicle:_____ NHTSA Vehicle Number: _____

Test No.:_____ Test Date(s: _____

Test Facility/Location: _____

Truck/Tractor Year, Make, and Model: _____

Trailer Year, Make, and Model: _____

Trk/Trac VIN/Unit No.:_____ Trlr. VIN/Unit No: _____

GVWR_____ GAWRs _____

CENTER OF GRAVITY HEIGHT, mm (in):

- Truck/Tractor (above ground): _____
- Trailer Ballast (above 5th wheel): _____
- Truck Ballast (above top of frame): _____

Wheelbase: Truck/Tractor, (in):_____ Trailer, (in): _____

Retarder(s) Type(s): _____

Aerodynamic Treatments: Yes _____ No _____ (Attach Photo)

BRAKES:

Axles:	Type[1]	Size	Make	Lining (Edge Code)
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____

[1] Cam, disc, wedge, etc.

APPENDIX C....Continued

BRAKE DRUM/ROTOR:

Axles:	Type[2]	Make	Dust Shields Installed?
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____

[2] Cast or composite drum, vented or non-vented rotor, etc.

ACTUATION DETAILS:

	AIR CHAMBERS		SLACK ADJUSTERS		
Axles:	Make	Type[3]	Length or Wedge angle	Mfr	Cam Rotation[4]
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____

[3] Size and diaphragm or piston

[4] Same or opposite to forward wheel rotation

TIRES

Axles:	Pressure (psi)	Size	Make	Model	Static Loaded Radius Measured	Static Loaded Radius Data book
1	_____	_____	_____	_____	_____	____
2	_____	_____	_____	_____	_____	____
3	_____	_____	_____	_____	_____	____
Trlr	_____	_____	_____	_____	_____	____

REMARKS:

APPENDIX C....Continued

ABS:

Mfr:_____ Model:_____ Configuration:_____

FRONT SUSPENSION:

Type:_____ Make:_____ Model:_____

REAR SUSPENSION:

Type:_____ Make:_____ Model:_____

Rear Axle Spread, (in):_____ Overall Width (SAE J693):_____

FIFTH WHEEL:

Fifth Wheel Height Relative to Ground (in): _____

Fifth Wheel Position, (in)[5]:_____
[5] Relative to rear axle(s) centerline (include sketch if necessary)

AIR SYSTEM:

Compressor Capacity (cfm):_____

Cut-out (psi):_____ Cut-in (psi):_____

Crack Pressure Ratings (psi)[5]:

1st Axle:_____ 2nd Axle):_____

3rd Axle:_____ Treadle Valve[6]:_____
[5] Relative to rear axle(s) centerline (include sketch if necessary)
[6] Total crack pressures between treadle valve and brake chambers

Bobtail Proportioning: □_____

Front Axle Limiting: □_____

APPENDIX C....Continued

Air Dryer: □_____

Air Compounding: □_____

Spring Brake Inversion Valve:
□ Number of Brakes Controlled:_____

Specifics Regarding Air Brake System Components:_____

_____

AIR TANK VOLUMES. (cu. in.):

Supply:_____ Primary:_____ Secondary:_____

Auxiliary:_____ Isolated From Service? □

SPECIAL CONDITIONS:

Special conditions or equipment that might affect brake performance:

_____

_____

_____

APPENDIX C....Continued

WEIGHTS (lbs):

Axle:	Empty	Burnish	Fully Loaded	GAWR
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____
Truck Total:	_____	_____	_____	_____
Trailer:	_____	_____	_____	_____
Total:	_____	_____	_____	_____

REMARKS:

APPENDIX C....Continued

DATA SHEET 2
VERIFICATION OF REQUIRED EQUIPMENT

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

SERVICE BRAKES

All Wheels Equipped with Brakes	□ Yes	□ No
All Brakes Equipped with Automatic Brake Adjusters	□ Yes	□ No
Brake Adjustment Indicators are visible from a location adjacent to or beneath the vehicle	□ Yes	□ No

ANTILOCK BRAKE SYSTEM

Antilock System Installed	□ Yes	□ No
Proper axle control	□ Yes	□ No

Comments:_____

Antilock Warning Signal within Drivers Field-of-View	□ Yes	□ No

SERVICE RESERVOIRS

No. of Reservoirs _____

Automatic Condensate drain valve(s) or supply reservoir	□ Yes	□ No
Automatic Operation of condensate drain valve	□ Yes	□ No
Each Reservoir has a Drain Valve which can be Manually Operated	□ Yes	□ No

PARKING BRAKES

Parking Brake Control Separate from Service Brake Control	□ Yes	□ No

APPENDIX C....Continued

Parking Brake Control Accessible from Operator's Seat		□ Yes	□ No
Parking Brake control is identified in a manner that specifies its operation		□ Yes	□ No
Parking Brake Control Operates Parking Brakes of Towed Vehicle	□ N/A	□ Yes	□ No

REMARKS:

APPENDIX C....Continued

DATA SHEET 3
LABORATORY TESTS

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

SERVICE RESERVOIR AIR PRESSURE GAUGE ACCURACY

SYSTEM 1

Compressor Cutout _____

7 % of Compressor Cutout _____

Compressor Cut-in _____

Pressure Readings:

Nominal Level	Test Gauge	Veh. Press. Gauge	Error
100			
80			
60			
40			
20			

REMARKS:

APPENDIX C....Continued

SYSTEM 2

Compressor Cutout _____

7 % of Compressor Cutout _____

Compressor Cut-in _____

Pressure Readings:

Nominal Level	Test Gauge	Veh. Press. Gauge	Error
100			
80			
60			
40			
20			

AIR PRESSURE WARNING SIGNAL

Visible Signal within Drivers Field of View □ Yes □ No

Audible Signal Installed □ Yes □ No

Pressure when Signal Deactivates _____ psi

Pressure when Signal Activates _____psi

STOP LAMP

Pressure at Which Stop Lamp Activated:

Slow Brake Application _____ psi

Rapid Brake Application _____ psi

Both activation pressures are 6 psi or less □ Yes □ No

REMARKS:

APPENDIX C....Continued

DATA SHEET 4
LABORATORY TESTS

Vehicle:_____ NHTSA Vehicle No.: _____

Date:_____ Driver:_____ Technician: _____

COMPRESSOR RECHARGE RATE

	Time from 85 to 100 psi	
	Primary	Secondary
Run 1		
Run 2		
Run 3		
Avg.		

Recharge rate meets requirement ☐ Yes ☐ No

REMARKS:

APPENDIX C....Continued

DATA SHEET 5
LABORATORY TESTS

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

SERVICE RESERVOIR VOLUME TEST

Reservoir Identification Number	Weight of Reservoir with Water (lb)	Weight of Reservoir without Water (lb)	Reservoir Volume (Weight of Water × 27.7)

CHAMBERS

Chamber Identification Number	Weight of Chamber with Water (lb)	Weight of Chamber without Water (lb)	Chamber Volume (Weight of Water × 27.7)

Total Reservoir Volume _____

Total Chamber Volume _____

Ratio of Total Reservoir Volume to Total Chamber Volume _____
REMARKS:

APPENDIX C....Continued

DATA SHEET 6
LABORATORY TESTS

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

SERVICE RESERVOIR HYDROSTATIC TEST

Test Pressure = _____ psi

Part# _____

RESERVOIR CIRCUMFERENCE MEASUREMENTS

	Location 1	Location 2	Location 3
Before Pressure Applied			
After Pressure Applied			
Change (Percent)			

Initial Pressure _____ Final Pressure _____

Pressure Loss _____

REMARKS: (Note any leaks, ruptures, evidence of stress)

APPENDIX C....Continued

RESERVOIR AIR LOSS

Method of Inducing Failure:

	Primary	Secondary
Pressure in Air System Prior to Inducing Failure	_____	_____
Pressure in Air System 10 minutes After Inducing Failure	_____	_____

REMARKS:

APPENDIX C....Continued

DATA SHEET 7
LABORATORY TESTS

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

TOWING VEHICLE PROTECTION

Trailer Reservoir Pressure	Towing Vehicle Primary Reservoir Pressure	Towing Vehicle Secondary Reservoir Pressure
100		
95		
90		
85		
80		
75		
70		
65		
60		
55		
50		
45		
40		
35		
30		
25		
20		

Table continued on next page

APPENDIX C....Continued

Trailer Reservoir Pressure	Towing Vehicle Primary Reservoir Pressure	Towing Vehicle Secondary Reservoir Pressure
15		
10		
5		
0		

Pressure at which protection valve activates: _____ psi

REMARKS:

APPENDIX C....Continued

DATA SHEET 8
LABORATORY TESTS

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

BRAKE ACTUATION AND RELEASE TIMES

Run No.	Axle 1		Axle 2		Axle 3		50 in^3 Reservoir	
	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)	Apply (sec)	Release (sec)
1								
2								
3								
Avg.								

CONTROL SIGNAL PRESSURE DIFFERENTIAL

Maximum pressure difference between input coupling and 50 in^3 reservoir:

for input pressures between 5 and 20 psi _____

for input pressures between 20 and 40 psi _____

for input pressures above 40 psi _____

REMARKS:

APPENDIX C....Continued

DATA SHEET 9
LABORATORY TESTS

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

PARKING BRAKE AND EMERGENCY BRAKE OPERATION:

PARKING BRAKE APPLICATION AND HOLDING

Parking brakes held in place by mechanical means □ Yes □ No

PARKING BRAKE ACCUMULATION OF ENERGY

Parking brakes apply after release with leak □ Yes □ No

MODULATED EMERGENCY BRAKING SYSTEM
(Truck Tractors, Trucks, and Buses Only)

Emergency brakes modulated by service brake control □ Yes □ No

Trailer brakes modulated by service brake control □ N/A □ Yes □ No

EMERGENCY BRAKING SYSTEM
(Trailer Converter Dollies Only)

Does dolly have parking brakes □ Yes □ No

If no, do service brakes apply when supply
line vented to atmosphere □ Yes □ No

PARKING BRAKE SYSTEM AUTOMATIC APPLICATION
(Trailers Only)

Parking brakes remain released for pressures above 70 psi □ Yes □ No

Parking brakes apply for pressures below 70 psi □ Yes □ No

REMARKS:

APPENDIX C....Continued

DATA SHEET 10
ROAD TESTS

BURNISH TEST

Vehicle:_____ NHTSA Vehicle Number: _____

BURNISH TEST WEIGHT AXLE 1: _____			
Driver No.	Date	Odometer Start	Odometer End
1			
2			
3			
4			

	Date	Time	Odometer
Test Start			
Test Finish			

	ADJUSTMENT LEVELS					
	1L	1R	2L	2R	3L	3R
Initial						
1st						
2nd						
3rd						
Final						

REMARKS:

APPENDIX C....Continued

Snub #	Initial Speed mph	Average Cntrl Press. (Optional)	Decel fps^2	Initial Brake Temperatures °F					
				1L	1R	2L	2R	3L	3R
1	40								
25	40								
50	40								
75	40								
100	40								
125	40								
150	40								
175	40								
200	40								
225	40								
250	40								
275	40								
300	40								
325	40								
350	40								
375	40								
400	40								
425	40								
450	40								
475	40								
500	40								

(Table continued on next page)

REMARKS:

APPENDIX C....Continued

Snub #	Initial Speed mph	Ambient Temp (°F)	Comments	Driver Initials	Time
1	40				
25	40				
50	40				
75	40				
100	40				
125	40				
150	40				
175	40				
200	40				
225	40				
250	40				
275	40				
300	40				
325	40				
350	40				
375	40				
400	40				
425	40				
450	40				
475	40				
500	40				

REMARKS:

APPENDIX C....Continued

DATA SHEET 11
ROAD TESTS

STABILITY & CONTROL

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Observer:_____

□ GVWR □ LLVW

Manually Controlled Retarder: N/A _____ ON_____ OFF_____

Maximum Drive Through Speed _____ mph

75% of Max Drive Through Speed _____ mph

Stop No.	Initial Speed (mph)	Apply Time (sec)	Approx. Dist. Out of Lane (ft)	Number Markers Hit	Comments
1					
2					
3					
4					

Ambient Temp.: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

APPENDIX C....Continued

DATA SHEET 12
ROAD TESTS

SERVICE BRAKE STOPPING TEST

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Observer:_____

BRAKE STROKE MEASUREMENTS at 85 psi (in)

Axle 1 Left/Right _____ /_____

Axle 2 Left/Right _____ /_____

Axle 3 Left/Right _____ /_____

□ GVWR □ LLVW

Manually Controlled Retarder. N/A_____ ON_____ OFF_____

60 MPH OR – MPH SERVICE BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp.:_____°F Wind Speed:_____mph Direction:_____

APPENDIX C....Continued

DATA SHEET 13
ROAD TESTS

EMERGENCY BRAKE STOPPING TEST

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Observer:_____

Manually Controlled Retarder. N/A_____ ON_____ OFF_____

PRIMARY RESERVOIR FAILURE
60 MPH OR--MPH EMERGENCY BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp.: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

APPENDIX C....Continued

DATA SHEET 14
ROAD TESTS

EMERGENCY BRAKE STOPPING TEST (CONTINUED)

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Technician:_____

SECONDARY RESERVOIR FAILURE
60 MPH OR--MPH SERVICE BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp. _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

APPENDIX C....Continued

DATA SHEET 15

ROAD TESTS

EMERGENCY BRAKE STOPPING TEST (CONTINUED)

PRIMARY CONTROL LINE FAILURE
60 MPH EMERGENCY BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp.: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

APPENDIX C....Continued

DATA SHEET 16
ROAD TESTS

EMERGENCY BRAKE STOPPING TEST (CONTINUED)

TRAILER CONTROL AND SUPPLY LINE FAILURE FOR TRUCK TRACTORS
60 MPH EMERGENCY BRAKE STOPS

Stop	Application Pressure (psi)	Initial Speed (mph)	Actual Stopping Distance (feet)	Corrected Stopping Distance per SAE J299	In 12 foot Lane	Wheel Lock-up Indication	Comments
1							
2							
3							
4							
5							
6							

Ambient Temp.: _____ °F

Wind Speed: _____ mph

Direction: _____

REMARKS:

APPENDIX C....Continued

DATA SHEET 17
ROAD TESTS

PARKING BRAKE TEST

Parking Brake Chamber Application Pressure Determination

Vehicle:_____ NHTSA Vehicle No.:_____

Test Performed By:_____ Date:_____

AXLE # _____

RUN NUMBER	PRESSURE IN PARKING CHAMBER AFTER 3 SECONDS (PSI)	
	LEFT	RIGHT
1		
2		
3		
AVERAGE		

If average pressure is less than or equal to 3 psi, use 0 psi

REMARKS:

APPENDIX C....Continued

DATA SHEET 18
ROAD TESTS

PARKING BRAKE TEST (Continued)

Static Retardation Force

Vehicle:_____ NHTSA Vehicle No.:_____

Test Performed By:_____ Date:_____

Parking Brake Chamber Pressure _____ psi

AXLE #_____ DRAWBAR PULL — PEAK FORCE DURING WHEEL ROTATION

Brake Temperature Before Forward Pull:_____ Before Reverse Pull:_____				
Pull Direction	0° - 90° Rotation	90° - 180° Rotation	180° - 270° Rotation	270° - 360° Rotation
FORWARD				
REVERSE				
Brake Temperature After Forward Pull:_____ After Reverse Pull:_____				

AXLE #_____ DRAWBAR PULL — PEAK FORCE DURING WHEEL ROTATION

Brake Temperature Before Forward Pull:_____ Before Reverse Pull:_____				
Pull Direction	0° - 90° Rotation	90° - 180° Rotation	180° - 270° Rotation	270° - 360° Rotation
FORWARD				
REVERSE				
Brake Temperature After Forward Pull:_____ After Reverse Pull:_____				

REMARKS:

APPENDIX C....Continued

DATA SHEET 19
ROAD TESTS

PARKING BRAKE TEST (Continued)
Grade Holding

Vehicle:_____ NHTSA Vehicle No.:_____

Driver:_____ Date:_____

□ GVWR □ LLVW

Parking Brake Chamber Pressure _____ psi

□ GVWR □ LLVW	Initial Brake Temperature (°F)	Control Pressure to Hold Vehicle (psi)	Movement to Become Stationary on Grade (inches)	Stationary on Grade for 5 minutes	
				Yes	No
Up Grade					
Down Grade					

REMARKS:

APPENDIX C....Continued

DATA SHEET 20
ROAD TESTS

FINAL INSPECTION

Vehicle:_____ NHTSA Vehicle No.:_____

Date:_____ Driver:_____ Observer:_____

BRAKE STROKE MEASUREMENTS AT 85 PSI (INCHES)

Axle 1 Left/Right _____ /_____

Axle 2 Left/Right _____/_____

Axle 3 Left/Right _____ /_____

SERVICE BRAKES

All Brakes Structurally Intact □ Yes □ No

All Brakes Function Properly □ Yes □ No

All Brakes Adjusted Within Manufacturers Recommendation □ Yes □ No

APPENDIX D

VEHICLE CONDITION REPORT

I. Report of Vehicle Condition Before Testing

CONTRACT NO.: DTNH22-_____ DATE: _____

MODEL YEAR/MAKE/MODEL/BODY STYLE:_____

NHTSA NO.: _____ BODY COLOR: _____ VIN: _____

ODOMETER READING: ARRIVAL - _____ miles ARRIVAL DATE - _____

DEALER'S (Leaser's) NAME: _____

ENGINE DATA: _____ Cylinders ____ Liters ____ Cubic inches

TRANSMISSION DATA: _____ Automatic ____ Manual ____ No. of speeds

GAWR"s: _____ Axle#1 ____ Axle #2e ____ Axle #3 ____Axle #4

GVWR: _____

TIRE DATA: Size _____ Mfr. _____

List other pertinent optional or special equipment packages below:

General Comments on the Condition of Vehicle:

APPENDIX D....Continued
VEHICLE CONDITION REPORT...Continued

REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING

Odometer Reading:_____ miles

List Equipment that is no longer on the test vehicle as noted on the vehicle condition report before testing:

Explanation for equipment removal:

Overall Condition of Test Vehicle:

Tires replaced: ___Yes ____No

New Brake Linings: Axle #1 ___Yes ___No

Axle #2 ___Yes ___No

Axle #3 ___Yes ___No

Additional Comments: